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REMARKS

Rejection under 35 U.S.C. 102

Claim 1 stands rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 4,932,747 to Russel. Applicants respectfully disagree.

Claim 1

In the Action, the Examiner notes that Russel recites "*individual fibers*" and therefore concludes that Russel shows ends that are "detachable from each other". However, the Applicants respectfully note that any teaching ends that are "detachable from each other" does not teach ends "detached from each other" as recited in claim 1, and respectfully submit that the Examiner has hereby acknowledged that claim 1 is not anticipated by Russel.

Besides, the Applicants respectfully submit that the Examiner has failed to show why one skilled in the art would have been motivated to detach the allegedly detachable input ends of Russel. The Applicants note that Russel relates (see col. 2, lines 44-51) to an apparatus "for homogenizing the intensity profile of an excimer laser" wherein "an excimer laser beam is collected by the input ends of a closely arranged optical fiber bundle array", which allows homogenizing the output of a laser with "reduced losses" (col. 2, lines 58-60).

The Applicants note that one skilled in the art readily understands from the reference that separating the input ends of the fibers instead of packing them would increase the losses instead of reducing them, thus adversely affecting the operation of the apparatus of Russel. The Applicants respectfully submit that actually one skilled in the art is taught away from detaching the individual input ends of Russel from each other, since this would prevent the Apparatus from operating as disclosed in Russel. So even assuming that the ends are "detachable", Russel teaches away from using ends "detached from each other" as claimed. Accordingly, the Applicants respectfully submit that claim 1 is patentable over Russel.

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Rejection under 35 U.S.C. 103

Claims 20, 23 and 26 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. No. 5,30373 to Harootian; claim 21 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Harootian in view of U.S. Pat. No. 6,827,500 to Basavanhally; claim 22 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Harootian in view of U.S. Pat. No. 5,045,100 to Smith; claim 24 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Harootian in view of Smith and further in view of U.S. Pat. No. 6,411,762 to Anthon; claim 25 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Harootian in view of U.S. Pat. No. 6,134,362 to Au-Yeung; claim 27 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Russel in view of U.S. Pat. No. 6,515,257 to Jain; claims 4-5, 9-11, 14, 19 and 28-30 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Russel in view of Au-Yeung; claims 2 and 13 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Russel in view of Au-Yeung and further in view of Basavanhally; claims 3 and 12 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Russel in view of Au-Yeung and further in view of Smith; claims 7 and 16 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Russel in view of Au-Yeung and further in view of Smith and Anthon; and claims 6, 8, 15 and 17 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Russel in view of Harootian.

Applicants respectfully disagree.

Claim 20

The Examiner opines that Harootian discloses all the features of claim 20 except the use of single mode fibers, and opines that Harootian places no limitations upon the kinds of fibers that may be used with its device (col. 4, lines 8-10 of Harootian recite that there is "*no criticality to the overall dimensions of the [...] individual optical fibers used*"). The rationale of the Examiner is that "one may draw the conclusion that all fibers would be suitable for such a device, including single mode fibers".

However the Applicants note that, contrary to the assertion of the Examiner, the above excerpt actually teaches one skilled in the art to use multimode fibers, since multimode fibers are fibers for which the overall dimensions are not critical, whereas

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dimensions are critical in single mode fibers. Applicants note that accordingly, the above excerpt shows that Harootian actually teaches away from using "*single mode*" fibers as recited in claim 20. At least for the above reason, the Applicants respectfully submit that claim 20 is patentable over Harootian.

Further, Applicants note that Harootian relates to a device for transferring pixel information, wherein it would be highly undesirable to couple the information of neighboring pixels since this would blur the output information of the device. Applicants note that the device of Harootian uses glass multimode fibers, whereby tapering the fibers as taught does not create significant coupling between the fibers, thus avoiding coupling between the pixels. Applicants respectfully submits that, as evidenced by the Hill reference cited by the Examiner, one skilled in the art would have readily understood that using single mode fibers in the device of Harootian would have introduced some coupling between neighboring pixels, thus adversely affecting the operation of the device. Applicants therefore respectfully submit that accordingly, one skilled in the art would also have been taught away from using single mode fiber in the device of Harootian by fear of generating undesirable coupling between the pixels (as taught by Hill), which would have blurred the output image of the device. For the above reason also, the Applicants respectfully submit that claim 20, which recites using "*single mode*" fibers, is patentable over Harootian.

Claims 23 and 26

Claims 23 and 26 depend on claim 20. The Applicants respectfully submit that at least in view of their dependency, claims 23 and 26 are patentable over Harootian.

Claim 21

The Examiner opines that the use of the teachings of Basavanhally with the device of Harootian would have been obvious, as the hexagonal array described by Basavanhally minimizes unused space within the optical fiber bundle. Applicants respectfully disagree and note for example that figures 2(a) and 2(b) of Harootian show non-hexagonal arrays where no space is lost within the optical fiber bundle. Applicants respectfully submit that the Examiner has failed to show how an hexagonal array could

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minimize the unused space in Harootian, in particular in view of the fact that there seems to be no such unused space in Harootian.

Besides, Applicants note that Harootian relates to an *"anamorphic fused fiber bundle which is tapered from the cross-sectional geometry at one end to a different cross-sectional geometry at the other end and which is useful to couple imaging devices"* (Col. 2, lines 22-25). Applicants respectfully submit that the Examiner has failed to show that one skilled in the art would have been motivated to give the apparatus of Harootian the shape disclosed in Basavanhally to modify an imaging device to have an hexagonal input or output. Why do that? What problem exists in Harootian that a person of ordinary skill is motivated to overcome with the teachings of Basavanhally? Why is "unused space" a problem in Harootian? And even if that were a problem, why use a hexagonal shape when imaging device having such a shape do not seem to exist?

Accordingly, Applicants respectfully submit that the combination of Harootian and Basavanhally is improper, and that at least in view of its dependency, claim 21 is also patentable over Harootian in view of Basavanhally.

Claim 22

Claim 22 depends on claim 20. Applicants respectfully submit that the Examiner has failed to show that Smith discloses using *"single mode"* fibers. Accordingly and in view of the above discussion of Harootian relative to claim 20, Applicants submit that the Examiner has failed to show that any combination of Harootian and Smith would have led one of ordinary skill in the art to an apparatus as recited in claim 20, and in particular using *"single mode"* optical fibers. Applicants therefore respectfully submit that claim 20 is patentable over Harootian and Smith, and that at least in view of its dependency, claim 22 is patentable over Harootian in view of Smith.

Claim 24

Claim 24 depends on claim 20. Applicants respectfully submit that the Examiner has failed to show that Anthon discloses using *"single mode"* optical fibers. Accordingly and in view of the above discussion relative to claim 22, Applicants submit that the Examiner has failed to show that any combination of Harootian, Smith and Anthon

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would have led one of ordinary skill in the art to an apparatus as recited in claim 20, and in particular using "single mode" optical fibers. Applicants therefore respectfully submit that claim 20 is patentable over Harootian, in view of Smith and further in view of Anthon, and that at least in view of its dependency, claim 24 is patentable over Harootian in view of Smith and further in view of Anthon.

Claim 25

Claim 25 depends on claim 20. The Applicants note that Au-Yeung relates to optical fiber couplers having a melted zone that *"provides strong field coupling between the optical fibers"* (col. 2, lines 43-44). As noted above in relation with claim 20, Harootian relates to an apparatus using multimode fibers for transferring pixel information from one imaging apparatus to another, wherein it is highly undesirable to introduce noise in the transferred pixel information. The Applicants respectfully submit that one skilled in the art would have lacked motivation to modify the apparatus of Harootian to have fibers coupled as in Au-Yeung, because such coupling between the fibers would have impaired the operation of the apparatus by introducing undesirable noise in the pixel information transferred by the apparatus. At least in view of the above, Applicants respectfully submit that the combination of Harootian and Au-Yeung is improper, and that claim 20 is patentable over Harootian in view of Au-Yeung. Applicants further submit that at least in view of its dependency on claim 20, claim 25 is patentable over Harootian in view of Au-Yeung.

Besides, the Applicants note that Harootian relates (see for example col. 2, lines 11-20) to an apparatus *"where the shape at one end is configured to fit precisely the corresponding cross-sectional shape of an imaging device and the shape at the other end is configured to fit precisely the cross-sectional surface area of a second imaging device to be coupled to the first"*.

The Applicant notes that Au-Yeung teaches (col. 1, lines 27-28) that heated fibers can be stretched until a desired coupling ratio is achieved. However, the Applicant note that Au-Yeung does not teach that it is possible to achieve simultaneously a desired optical coupling and a required size and shape.

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Accordingly, the Applicants respectfully submit that, even if one skilled in the art had decided, for a non-specified reason, to combine the teachings of Harootian and Au-Yeung to make a precisely dimensioned device such as recited by Harootian, having the coupled fibers of Au-Yeung, the coupling between the fibers would have been given by the precise size and shape of the apparatus. Applicants note that such a given coupling would not have read on "*a desired amount of optical coupling between each optical fiber*" as recited in claim 25. In view of the above also, the Applicants respectfully submit that claim 25 is patentable over Harootian in view of Au-Yeung.

Claim 27

The Examiner opines that Jain discloses single mode fibers (column 9, lines 21-24) and opines that it would have been obvious to one of ordinary skill to combine the teachings of Russel and Jain, as the use of these fibers allow the device to be applicable to areas where it is desirable to transmit only a single mode.

Applicants respectfully disagree. Applicants note that Russel relates to an apparatus provided to homogenize the intensity profile of the beam emitted by an excimer laser with reduced losses (col. 2, lines 58-59). Russel teaches that an excimer laser is of multimode nature (col. 5, lines 16-17). Applicants respectfully submit that modifying the apparatus of Russel "to transmit only a single mode" of a laser of multimode nature would transmit less power and go against the object of Russel to reduce losses.

Besides, the Applicants note that Jain teaches, column 9, lines 21-26, using very thin "*UV-grade fused silica fibers with 5 to 10 micron diameter cores and several micron thick cladding*" to form an "*array with a pitch of 6 to 30 microns*". The Applicants note that the fibers disclosed by Jain have a cladding diameter to core diameter ratio from 1.2:1 (5 micron diameter core with array pitch of 6 microns) to 6:1 (5 micron diameter core with array pitch of 30 microns). The Applicants further note that Russel explicitly teaches (col. 4, lines 10-13) that "*each fiber core radius should be large compared to the cladding thickness for optimal packing efficiency (a cladding diameter to core diameter ratio of 1.2:1 is typical)*". Applicants respectfully submit that one skilled in the art would readily understand that modifying the apparatus of Russel to use the fibers of Jain would at

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best offer no advantage with regard to the cladding to core diameter ratio recited in Russel (1.2:1), and would most likely lead to a detrimental increase of this ratio (up to 6:1), which would not provide an "*optimal packing efficiency*" as described by Russel.

The Applicants further note that Russel relates to an apparatus having an input of typically 12 millimeter by 25 millimeter (col. 4, lines 25-27) using fibers having a cladding diameter of 2400 microns (col. 5, lines 65-67), thus roughly corresponding to an apparatus comprised of 125 fibers. The Applicants note that using the fibers of Jain having the best cladding to core diameter ratio of 1.2:1, i.e. having a cladding diameter of 6 microns, would mean manufacturing an apparatus comprised of more than 8.3 million fibers. Besides, Applicants note that fibers of 6 microns in diameter are likely to be very fragile and extremely delicate to handle. The Applicants submit that one skilled in the art readily understands that multiplying by more than sixty-six thousand the number of fibers to be handled to manufacture an apparatus, while at the same time using fibers far more delicate to handle, would probably increase the costs of manufacturing of the apparatus. Why do that? To get less energy at its output?

In view of the above, the Applicants respectfully submit that one skilled in the art would have lacked motivation for using the fibers of Jain in the apparatus of Russel because doing so would at least have meant reducing the power transmitted by the apparatus while not improving the cladding to core diameter ratio, and would even have been taught away from using the fibers of Jain in the apparatus of Russel because of the tremendous increase of the costs of manufacturing of the apparatus -without technical improvement of the apparatus- that this would have meant.

Applicants therefore respectfully submit that the combination of Russel and Jain is not proper, and that claim 27 is patentable over Russel and Jain.

Claim 28

The Applicants note that in relation with claim 28, the Examiner agrees that Russel fails to teach fibers stretched in order to provide a desired amount of optical coupling between each optical fiber, but keeps opining that Russel discloses that the bundle is stretched during the tapering process. The Applicants note that in page 10 of the response to the action issued on July 25, 2005, the Applicants had submitted that

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Russel does not mention stretching optical fibers, and had respectfully requested the Examiner to point out where Russel discloses or suggests that stretching occurs. The Applicants note that the Examiner has failed in the present action to show where Russel discloses or suggests that stretching occurs.

The Examiner notes Au-Yeung discloses that stretching fibers while fusing them together lead to various amounts of coupling between the cores of fibers, and opines that it would have been obvious to modify the device of Russel to achieve the desired amount of coupling by stretching the fused portion of the bundle by an amount denoted by Au-Yeung, thereby allowing for greater specialization of the bundle, and more accurate formation of the bundle's coupling ratio. The Applicants respectfully disagree with the Examiner.

The Applicants note as a preamble that Au-Yeung shows (figures 5 and 7) fibers having a cladding to core diameter ratio visibly larger than the ratio of 1.2:1 taught by Russel. Applicants note that it has been seen above that Russel explicitly teaches away from having a large cladding to core ratio, to "prevent transmission losses resulting from scattering into the bundle cladding". Accordingly, Applicants respectfully submit that one skilled in the art would have lacked motivation to use the fibers of Au-yeung in Russel because this would have increased the cladding to core diameter ratio, thus increasing the power losses in the apparatus of Russel, and impairing its performances.

Applicants further note that, by teaching a typical cladding to core ratio of 1.2:1, Russel also implicitly teaches away from using a small cladding to core ratio, thus teaching away in particular from an apparatus with no cladding at all around the cores, where the different cores would contact each other and where coupling would occur. Applicants submit that one skilled in the art would read Russel as teaching away from an apparatus with some coupling between the fiber cores.

Besides, the Applicants note that Russel teaches (for example column 6, lines 26-29) tapering the exit ends of optical fibers to a required size and shape to eliminate the subsequent need for reshaping and focusing the rectangular excimer profile and the associated energy losses that may otherwise be encountered.

The Applicants note that Au-Yeung teaches (col. 1, lines 27-28) that heated fibers can be stretched until a desired coupling ratio is achieved, but does not teach that it is

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possible to achieve simultaneously a desired optical coupling and a required size and shape. Accordingly, Applicants respectfully submit that even if one skilled in the art had, for some undisclosed reason, decided to use the fibers of Au-Yeung in Russel, and for another undisclosed reason had decided to stretch the fibers until coupling appears between the fibers, instead of simply tapering them, one skilled in the art would still have obtained between the fibers a given coupling corresponding to the required size and shape of Russel. The Applicants respectfully submit that an apparatus having such a given coupling would not read on an apparatus *"wherein the plurality of optical fibers disposed in the fused section are stretched to provide a desired amount of optical coupling between each optical fiber"*, as recited in claim 28.

For the above reasons at least, the Applicants respectfully submit that claim 28 is patentable over Russel in view of Au-Yeung.

Claims 9, 11 and 29

The Applicants respectfully submit that the above arguments as to claim 28 can be used to show that even if one skilled in the art had, despite the lack of motivation for doing so, combined the teachings of Russel and Au-Yeung, one would not have obtained an apparatus as claimed in claim 9, and in particular *"wherein the plurality of optical fibers disposed in the fused section are uniformly stretched to provide a desired amount of optical coupling between each optical fiber"*; a method as recited in claim 11 and in particular *"wherein tapering the fused section comprises uniformly stretching the plurality of optical fibers to provide a desired amount of optical coupling between each optical fiber"*; or an apparatus as recited in claim 29, and in particular *"wherein the plurality of optical fibers disposed in the fused section are stretched to provide a desired amount of optical coupling between each optical fiber"*. Accordingly, the Applicants respectfully submit that claims 9, 11 and 29 are patentable over Russel in view of Au-Yeung.

Claims 4-5, 10, 14, 19 and 30

Claims 4-5 and 10 depend on claim 28; claims 14 and 19 depend on claim 11 and claim 30 depends on claim 29. Applicants respectfully submit that at least in view of

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their dependency, claims 4-5, 10, 14, 19 and 30 are patentable over Russel in view of Au-Yeung.

Claims 2 and 13

Claim 2 depends on claim 28 and claim 13 depends on claim 11. The Applicants respectfully submit that the Examiner has failed to show that Basavanhally discloses or suggests an apparatus as recited in claim 28, and in particular *"wherein the plurality of optical fibers disposed in the fused section are stretched to provide a desired amount of optical coupling between each optical fiber", or a method as recited in claim 11, and in particular "wherein tapering the fused section comprises uniformly stretching the plurality of optical fibers to provide a desired amount of optical coupling between each optical fiber". Accordingly, and in view of the above discussion as to the patentability of claims 28 and 11 over Russel in view of Au-Yeung, the Applicants respectfully submit that the Examiner has failed to show that any combination of Russel, Au-Yeung and Basavanhally would have led one of ordinary skill in the art to an apparatus as recited in claim 28 or to a method as recited in claim 11.*

Accordingly, Applicants respectfully submit that claims 28 and 11 are patentable over Russel in view of Au-Yeung and further in view of Basavanhally, and Applicants submit that at least in view of their dependency, claims 2 and 13 are patentable over Russel, Au-Yeung and Basavanhally.

Claims 3 and 12

Claim 3 depends on claim 28 and claim 12 depends on claim 11. Applicants submit that the Examiner has failed to show that Smith discloses or suggests an apparatus as recited in claim 28, and in particular *"wherein the plurality of optical fibers disposed in the fused section are stretched to provide a desired amount of optical coupling between each optical fiber", or a method as recited in claim 11, and in particular "wherein tapering the fused section comprises uniformly stretching the plurality of optical fibers to provide a desired amount of optical coupling between each optical fiber". In view of the above discussion as to the patentability of claims 28 and 11 over Russel in view of Au-Yeung, the Applicants respectfully submit that the Examiner has failed to show that any*

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combination of Russel, Au-Yeung and Smith would have led one of ordinary skill in the art to an apparatus as recited in claim 28 or to a method as recited in claim 11 and in particular having the above features. Accordingly, Applicants respectfully submit that claims 28 and 11 are patentable over Russel in view of Au-Yeung and further in view of Smith, and that at least in view of their dependency, claims 3 and 12 are patentable over Russel in view of Au-Yeung and Smith.

Claims 7 and 16

Claim 7 depends indirectly on claim 28, and claim 16 depends indirectly on claim 11. Applicants submit that the Examiner has failed to show that Anthon discloses or suggests an apparatus as recited in claim 28, and in particular *"wherein the plurality of optical fibers disposed in the fused section are stretched to provide a desired amount of optical coupling between each optical fiber"*, or a method as recited in claim 11, and in particular *"wherein tapering the fused section comprises uniformly stretching the plurality of optical fibers to provide a desired amount of optical coupling between each optical fiber"*. Accordingly, and in view of the above discussion with regards to claims 3 and 12, Applicants respectfully submit that the Examiner has failed to show that any combination of Russel, Au-Yeung, Smith and Anthon would have led one of ordinary skill in the art to an apparatus as recited in claim 28 or to a method as recited in claim 11.

Besides, Applicants note that the Examiner opines that Anthon's technology minimizes "any input that may be passed from the optical fiber within the bundle to another" and consequently minimizes coupling between the fibers, and respectfully note that according to the interpretation of the Examiner, Anthon actually teaches away from coupling the fibers, and in particular with a *"desired amount of optical coupling"* as recited in claims 28 and 11.

In view of the above, Applicants respectfully submit that claims 28 and 11 are patentable over Russel in view of Au-Yeung and Smith and further in view of Anthon. Applicants submit that at least in view of their dependency, claims 7 and 16 are patentable over Russel in view of Au-Yeung, Smith and Anthon.

Claims 6, 8, 15 and 17

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Claims 6 and 8 depend directly or indirectly on claim 28, and claims 15 and 17 depend directly or indirectly on claim 11. Applicants submit that the Examiner has failed to show that Harootian discloses or suggests an apparatus as recited in claim 28, and in particular *"wherein the plurality of optical fibers disposed in the fused section are stretched to provide a desired amount of optical coupling between each optical fiber"*, or a method as recited in claim 11, and in particular *"wherein tapering the fused section comprises uniformly stretching the plurality of optical fibers to provide a desired amount of optical coupling between each optical fiber"*. Accordingly, and in view of the above discussion with regards to the patentability of claims 28 and 11 over Russel and Au-Yeung, Applicants respectfully submit that the Examiner has failed to show that any combination of Russel, Au-Yeung and Harootian would have led one of ordinary skill in the art to an apparatus as recited in claim 28 or to a method as recited in claim 11. Accordingly, Applicants respectfully submit that claims 28 and 11 are patentable over Russel in view of Au-Yeung and Harootian. Applicants submit that at least in view of their dependency, claims 6 and 15 are patentable over Russel in view of Au-Yeung and further in view of Harootian.

* * *

In view of the above, Applicants submit that the application is now in condition for allowance and respectfully urge the Examiner to pass this case to issue.

The Commissioner is authorized to charge any additional fees that may be required or credit overpayment to deposit account no. 12-0415. In particular, if this response is not timely filed, the Commissioner is authorized to treat this response as including a petition to extend the time period pursuant to 37 CFR 1.136(a) requesting an extension of time of the number of months necessary to make this response timely filed and the petition fee due in connection therewith may be charged to deposit account no. 12-0415.

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